* Get out HW

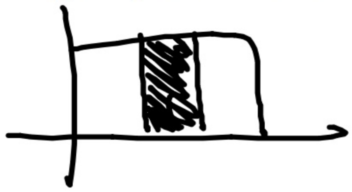
* Get out application 3.1 and finish Application 3.1 (15 mins)

* Get out 3.2 notes packet (if you printed it)

Intro Stat: 3.2 notes

Think back to the dice experiment.....

What SHOULD the results have looked like? Again, draw the histogram



Now draw the density curve that estimates the population of dice rolls.

Describe this shape:

unimodal, symmetric

NORMAL CURVE:

Shape:

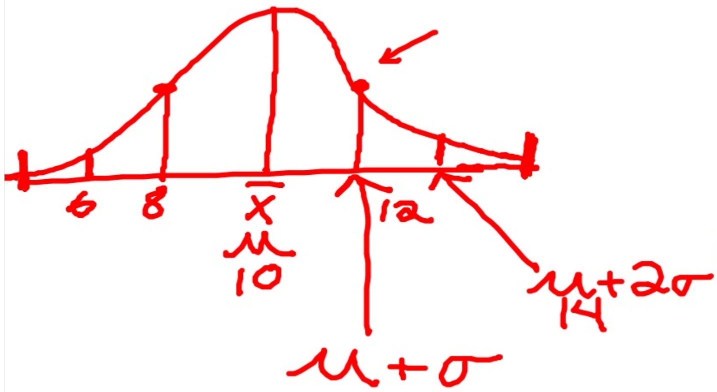
Described by... mean & std. deviation

Mean shows... center of curve

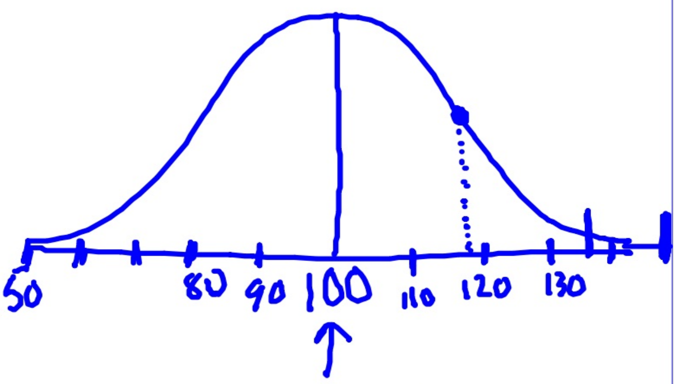
Standard deviation shows... spread of curve

Examples of curves:

(1) (2) (3)



$\mu = 10 \quad \sigma = 2$



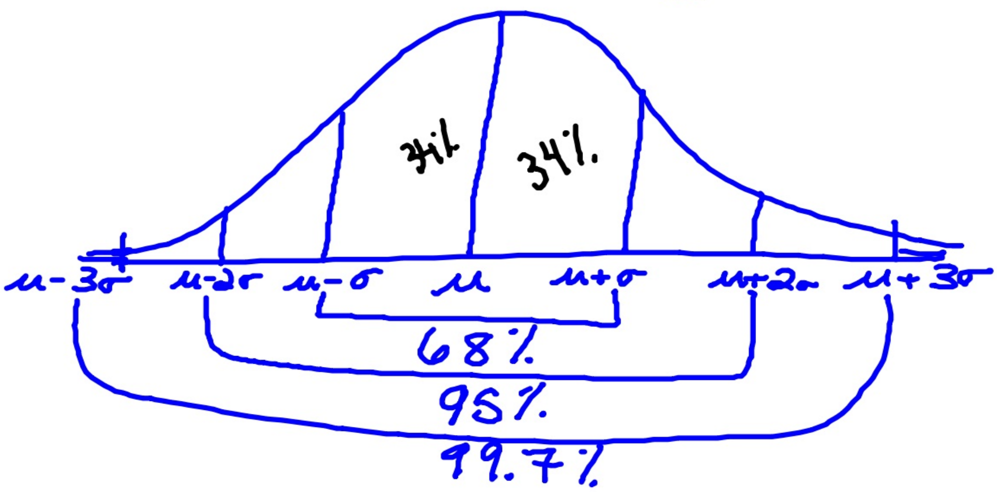
$\mu = 100$
$\sigma = 19$

Approximating the Std. Deviation:

<u>The 68-95-99.7% rule</u> On a N(μ , σ) curve

normal

Picture:



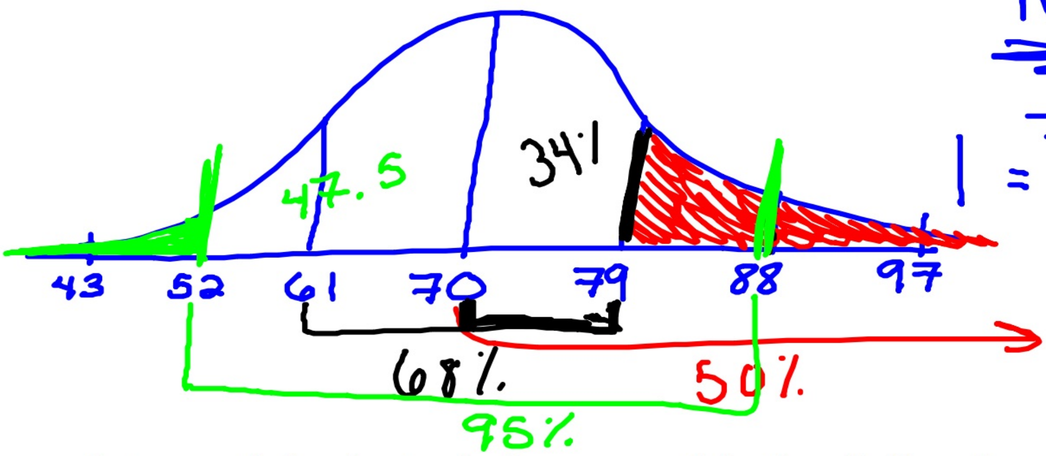
68 % of the data is within $\mu \pm \sigma$

95 % of the data is within $\mu \pm 2\sigma$

99.7 % of the data is within $\mu \pm 3\sigma$

Example: Test scores on the Ch. 5 test have a mean of 70 and a standard deviation of 9. Draw the normal curve below:

$N(70,9)$



$1 = \frac{79-70}{9}$

Draw pictures/shade to help you with the following:

What percent of the students scored between 61 and 79? 68%

What percent of students scored above 79? 16%

What percent of students scored below 52? 2.5%

What percent of students scored ~~above~~ below 79?

Examples:

1) The life expectancy of a particular brand of light bulb is normally distributed with a mean of 1500 hours and a standard deviation of 75 hours.

a. Sketch the picture of this normal curve below. Be sure to label the picture!

b. What percent of the light bulbs last more than 1575 hours?

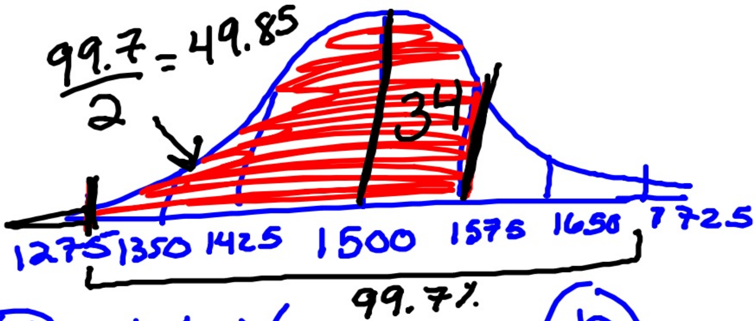
c. What percent of the light bulbs last between 1350 & 1650 hours?

d. What percent of the light bulbs last less than 1350 hours?

e. What percent of the light bulbs last more than 1725 hours?

f. What percent of the light bulbs last between 1425 and 1650 hours?

g. What percent of the light bulbs last between 1275 and 1575 hours?



$N(1500, 75)$

b) 16%

c) 95%

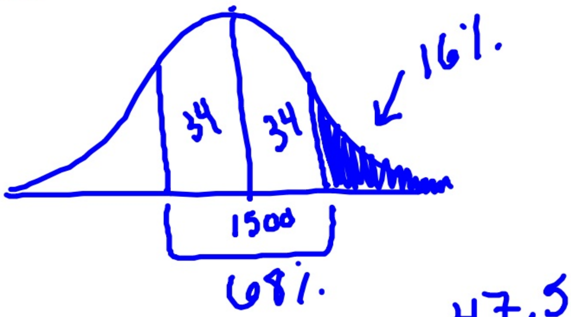
d) 2.5%

e) 0.15%

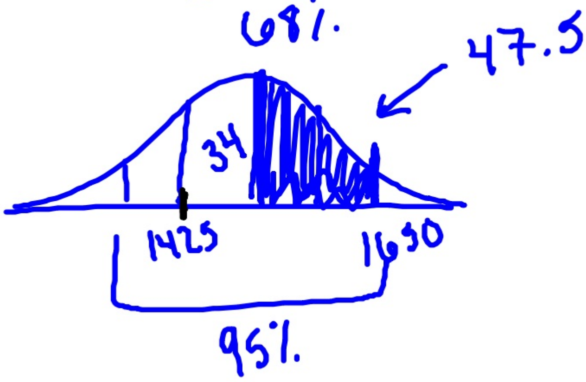
f) 81.5%

g) 83.85%

b



f

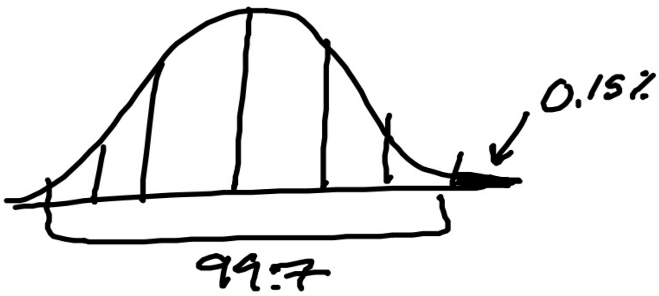


$N(111, 11)$

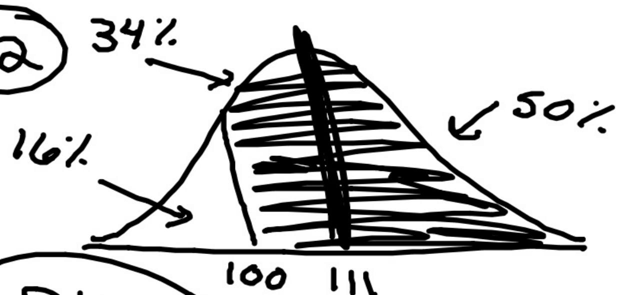
21 $\mu \pm 2\sigma$

$111 \pm 2(11)$

$(89, 133)$



22



84%

$\mu = 10$

$\sigma = 2$

Question:

- If I know that I am 1 standard deviation above my mean, what is my percentile?

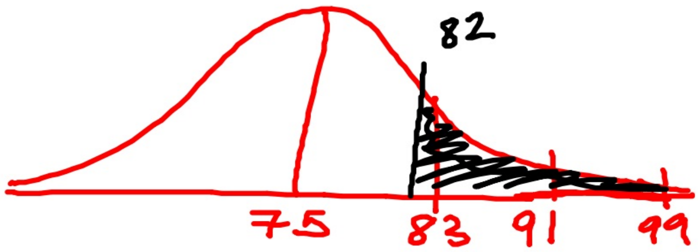
% below

- If I know I have a z-score of -2, what is my percentile?

Example:

Test scores are normally distributed with a mean of 75 and a standard deviation of 8. What percent of students scored above 82?

$N(75, 8)$



So what's wrong with this?

So what is the most accurate way to solve these types of problems?

CALCULATOR!

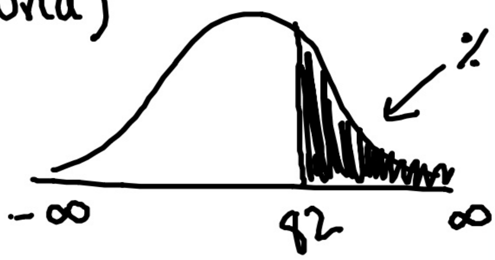
$$z = \frac{82-75}{8} = 0.875$$

FUNCTIONS ON THE CALCULATOR:

- Go to 2^{ND}, then DISTR (the VARS button)

82,

NORMALCDF(lower bound, upper bound)

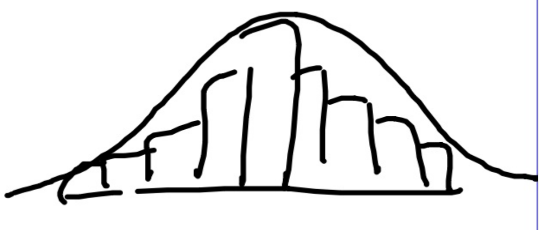


- Used for…

when you have #'s, want %

- Infinity on the calculator…

E99



- Examples:

Test scores from above. Same question: What percent of students scored above 82?

$N(75, 8)$

$$z = \frac{82-75}{8} = 0.875$$

0.875

$$P(z > 0.875) = 19.08\%$$

How about between 70 and 80?

$$z = \frac{70-75}{8} = -0.625$$

$$z = \frac{80-75}{8} = 0.625$$

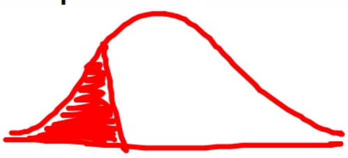
70   80

-0.625 0.625

$$P(-0.625 < z < 0.625)$$

What percent of students scored below 68?

$$z = \frac{68-75}{8} = -0.875$$



68

-0.875

$$P(z < -0.875) =$$

$N(75, 8)$

4 What % are btw. 62 and 90?

5 What % above 91?

6 What % below 70?

Warm Up Answers:

work

2) c) $z = -0.9$

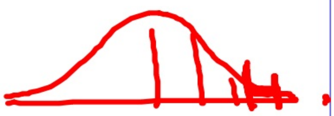
$\underbrace{P(z < -0.9)} = 18.41\% = 0.1841$

normcdf(-E99, -0.9)

d) $z = 2.44$

normcdf(2.44, E99)

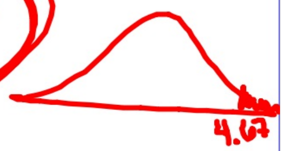
$P(z > 2.44) = 0.734\%$



e) $z = 4.67$

1.508.... E -6

$P(z > 4.67) = 1.508 \times 10^{-6}$



f) $z = 4.67$

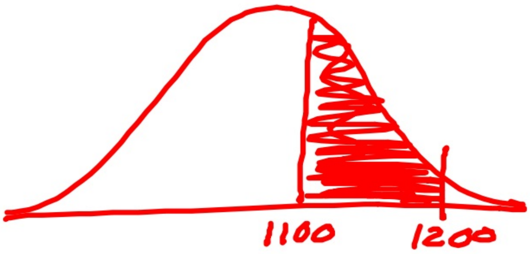
$P(z < 4.67) = 99.99\%$

9 (1100, 1200)

$P(1100 < z < 1200) =$

$\text{normcdf}(0.22, 1.33)$

$= 32.09\%$

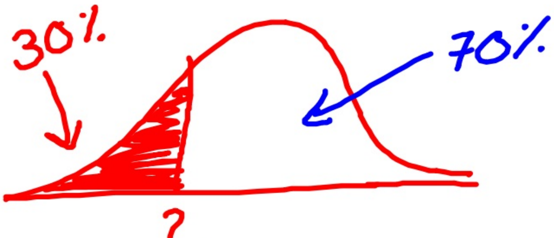


$$z = \frac{1100-1080}{90} = 0.22$$

$$z = \frac{1200-1080}{90} = 1.33$$

Example 2: Same test scores. Average of 75, standard deviation of 8. What score has 30% of the data below it?

N(75, 8)



INVNORM(% below)

invnorm(0.30)

- Used for...

when have %, need the observation

$$-0.52 = \frac{X-75}{8}$$

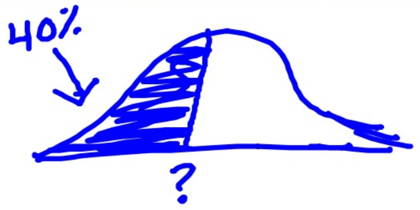
- Only does...

% below

X = 70.84 pts.

- Examples: $N(75, 8)$

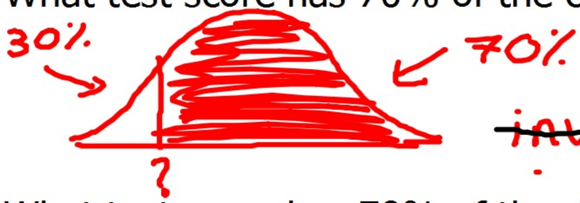
Same test scores as above. What test score has 40% of the data **below** it?



$\text{invnorm}(0.40) = -0.253 = \dfrac{X - 75}{8}$

$X = 72.976$ pts.

What test score has 70% of the class **above** it?



~~invnorm(0.3)~~ $z = 0.524 = \dfrac{X - 75}{8}$

$X = 70.8$ pts.

What test score has 70% of the data **below** it?

$X = 79.2$ pts.

PROBABILITY NOTATION:

What percent of students scored above an 82?

What percent of students scored between 70 and 80?

What score has 30% of the data below it?

Example 1: USE PROBABILITY NOTATION and show z-scores

The life expectancy of wood bats is normally distributed with a mean of 60 days and a standard deviation of 17 days.

a) What is the probability that a randomly chosen bat will last at least 60 days?

50%

b) What percent of bats will last at least 70 days? 27.83%

c) What percent of bats will last between 40 and 80 days? 76.04%

d) What is the probability that a bat will break during the first month (30 days)?

3.88%

e) What percent of bats will last less than 40 days? 11.98%

f) What amount of days do 40% of the bats last **longer** than? 64.31 days

g) What amount of days do 30% of the bats last **under**? 51.09 days

Answers to Example #1

a) 50%

b) 27.83%

c) 76.04%

d) 3.88%

e) 11.98%

f) 64.31 days

g) 51.09 days

Do examples 2 and 3 in the notes packet